PATENT ABSTRACTS OF JAPAN

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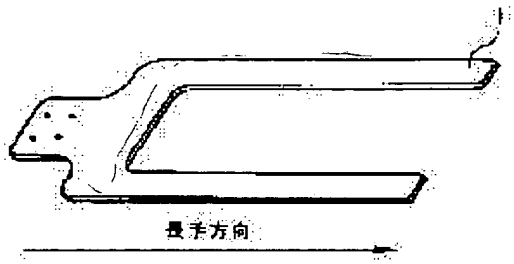
(71)Applicant : **MITSUBISHI CHEMICAL CORP**
(72)Inventor : **NISHIMOTO TADAHIRO**

(54) **HAND FOR TRANSFER APPARATUS**

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce flexure and to improve reliability, by constituting a hand for transfer apparatus of long carbon fibers and a resin, and setting a bending elastic modulus to be more than a specified value.
SOLUTION: In a transfer hand 1, carbon fibers constituting a prepreg are arranged so that they are plane symmetric in such a way that the prepreg where plural carbon fibers are arranged in one direction is stacked. Non-hardened thermosetting resin is previously impregnated in the carbon fibers which are thus formed and the bending elastic modulus in the longitudinal direction of the transfer hand 1 is set to be not less than 130 GPa so that the longitudinal direction of the transfer hand 1 becomes almost parallel to the direction of the carbon fibers constituting the prepreg of the outermost layer. Thus, distortion and skewness are small even if heat distribution is generated in the transportation hand 1 and the positioning of the transfer hand 1 can easily be controlled.



a plurality of fibers

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CLAIMS

[Claim(s)]
[Claim 1] Substantially, it consists of a long carbon fiber and a long resin, and bending elastics modulus are 130GPa(s). Hand for transport devices which it is above.
[Claim 2] The modulus of elasticity in tension of a carbon fiber is 2 50t/mm. Hand for transport devices according to claim 1 which it is above.
[Claim 3] The hand for transport devices according to claim 1 or 2 whose thermal conductivity of a carbon fiber is 100 or more W/mK.
[Claim 4] The hand for transport devices given in the claim 1, or 3 any 1 terms whose coefficient of thermal expansion of a carbon fiber is less than [0/degree C].
[Claim 5] The hand for transport devices given in the claim 1, or 4 any 1 terms which consist of carbon fiber reinforced plastics which carried out the laminating of the prepreg which lengthened and arranged the carbon fiber with ** on the other hand using the resin.
[Claim 6] The hand for transport devices according to claim 5 by which it is arranged so that the carbon fiber which a laminating is carried out so that the field of the prepreg which lengthened and arranged the carbon fiber with ** on the other hand may become the field and parallel which carry the conveyance object of the hand for transport devices, and constitutes the aforementioned prepreg may become symmetrical with a field, and the carbon fiber from which the prepreg of an outermost layer of drum constitutes a prepreg is further arranged with the longitudinal direction of a hand.
[Claim 7] The hand for transport devices according to claim 6 which carried out the laminating of the prepreg which becomes the outside of the prepreg which lengthened and arranged the carbon fiber with ** on the other hand from a carbon fiber cross.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the hand used for a transport device. For example, in the automatic transferring machine which moves the thing of the tabular of a silicon wafer, the glass substrate for liquid crystal, etc., and is discharged and shipped, it is related with the hand for transport devices attached in the portion which carries maintenance or a tabular object and touches a plate in a tabular object.
[0002]
[Description of the Prior Art] For example, tabular objects, such as a silicon wafer, are picked out from a receipt case, it sets in various processors or the transport device as shown in drawing 1 for recontaining the thing after processing in a receipt case from equipment etc. is used. In order to gather receipt space efficiency in the receipt case of a tabular object, to make the receipt interval of a tabular object small is desired. Moreover, in order to raise the precision of a product, precision is demanded also about positioning of the set location within a processor. On the other hand, in order that tabular objects, such as a silicon wafer and a glass substrate for liquid crystal, may gather the efficiency of down stream processing, the size of a tabular object is becoming large gradually. Therefore, the hand for transport devices needs to lengthen length more in order to support a big tabular object. Conventionally, such a hand is formed in metals and JP,8-288364,A, such as aluminum, by the carbon-fiber-reinforced-plastics composite (henceforth "CFRP") like a publication.
[0003]
[Problem(s) to be Solved by the Invention] If length is lengthened, it will be greatly bent by the hand for transport devices made from aluminum with the self-weight of a hand, and the weight of a conveyance object. moreover, the hand of the product [hand / made from CFRP] made from aluminum -- high rigidity -- and although a deflection can be suppressed since it is low specific gravity, since thermal conductivity is small, temperature distribution occur and the conventional CFRP has the problem of producing heat distortion, when heat starts Moreover, the hand made from the conventional CFRP also has the problem of being inferior to machinability. Then, bending aims at offering the few reliable hand for transport devices in this invention.
[0004]
[Means for Solving the Problem] As a result of this invention person's inquiring wholeheartedly in view of the above-mentioned technical problem, the hand for transport devices which has a specific bending elastic modulus bent, found out that deformation by heat etc. was solvable, and reached this invention. That is, it is the hand for transport devices which the summary of this invention is attached at the nose of cam of a transport device, and carries a conveyance object, the aforementioned hand for transport devices consists of a long carbon fiber and a long resin substantially, and bending elastics modulus are 130GPa(s). It consists in the hand for transport devices which it is above.
[0005]
[Embodiments of the Invention] Hereafter, this invention is explained in detail. as the carbon fiber which constitutes the hand for conveyance -- a pitch system and a PAN system -- although all can be used, a mesophase pitch system is preferably used from points -- the carbon fiber which is high temperature conduction is comparatively easy to be obtained at low temperature with the rate of high elasticity -- the carbon fiber used by this invention -- JIS the modulus of elasticity in tension of the carbon fiber measured by Instron type testing machine based on K7073 -- usually -- 50t/mm2 the above -- desirable -- 60-95t/mm2 it is . A modulus of elasticity in tension is 2 50t/mm. If it does not fill, the effect of sufficient flexural rigidity not being obtained but reducing a deflection is small.
[0006] Moreover, JIS 100 or more W/mK of thermal conductivity of the carbon fiber measured based on R1611 by TC300 made from laser flash method vacuum science and engineering is usually 140 or more W/mK preferably. When thermal conductivity did not fulfill 100 W/mK, it becomes low thermal conductivity as compared with a metallic material when it composite-izes with the matrix by the resin, for example, a part of hand for transport devices is heated for a certain reason, that heat distribution becomes uniform takes time. Thus, deformation arises in the portion heated when heat distribution arose in the hand for conveyance, and control of positioning of the hand for transport devices becomes difficult.
[0007] furthermore, the coefficient of thermal expansion of a carbon fiber -- usually -2.0x10-6 - 0-/degree C -- it is -2.0x10-6 - -1.0x10-6/degree C preferably since the expansion or contraction produced when the time of surrounding temperature changing and the hand for conveyance are heated or cooled partially, since there are few effects of holding down the thermal expansion of a matrix resin when coefficient of thermal expansion exceeds 0-/degree C becomes large too much, it comes to be difficult to

control a position
[0008] 3-30 micrometers of diameters of fiber of a carbon fiber are usually 5-15 micrometers preferably. You may use together a part of carbon fiber which has the above-mentioned modulus of elasticity in tension out of range, thermal conductivity, and coefficient of thermal expansion as a carbon fiber used for the hand for transport devices of this invention. A carbon fiber needs to be a continuous glass fiber, and it is desirable to use the prepreg which lengthened and arranged the carbon fiber with ** on the other hand. A prepreg means what made the long carbon fiber the shape of a sheet using thermosetting resin etc. As for a prepreg, it is desirable to carry out a laminating so that it may become the field and parallel which carry the conveyance object of the hand for conveyance. Since the part can maintain the intensity of the hand for conveyance, it is desirable to make it arrange so that the grain direction of the carbon fiber which constitutes the prepreg which the prepreg lengthened the carbon fiber to ** on the other hand, and was arranged may turn into the longitudinal direction, the abbreviation parallel direction and longitudinal direction, and abbreviation perpendicular direction of the hand for conveyance at least. Since the curvature by heat etc. can be reduced by arranging so that the carbon fiber which constitutes a prepreg may become symmetrical with a field when the laminating of the prepreg which, on the other hand, lengthened and arranged two or more carbon fibers with ** is carried out, it is desirable. It is what carried out the laminating of the carbon fiber so that isotropy might specifically be shown in false to the direction of a field of the field on which the conveyance object of the hand for conveyance is put. When the length direction of the hand for conveyance is made into 0 degree, 0 degree / 60 degrees / -60 degrees / -60 degrees / 60 degrees / 0 degree or 0 degree / 45 degrees / 90 degrees / -45 degrees / -45 degrees / 90 degrees / 45 degrees / 0 etc. degree is mentioned. In this case, since making it the longitudinal direction of the hand for conveyance and the direction of the carbon fiber which constitutes the prepreg of an outermost layer of drum become abbreviation parallel can make high the bending elastic modulus of the longitudinal direction of a hand, it is desirable. Since cutting, drilling processing, etc. can be performed easily, it is desirable to carry out the laminating of the prepreg which becomes the outside of the prepreg which lengthened and arranged the carbon fiber from a carbon fiber cross.
[0009] As a resin which constitutes the hand for transport devices, an epoxy resin, phenol resin, Thermosetting resin, such as an unsaturated polyester resin, vinyl ester resin, polyimide resin, and acrylic resin, Polypropylene RIREN (PP), a polyamide (PA), and a polybutylene terephthalate (PBT), A polycarbonate (PC), polyethylene (PE), and polyether imide (PEI), A polyether ether ketone (PEEK) and a polyether ketone (PEK), Polyether nitril (PEN) and polyether sulphone (PES), A polyethylene terephthalate (PET), a polyimide (PI), and a polyacetal (POM), Thermoplastics, such as polyphenylene sulfide (PPS) and polystyrene (PS), is mentioned, it is desirable, thermosetting resin is especially desirable, and an epoxy resin is used in respect of a moldability and various physical properties.
[0010] You may blend a flame retarder, a coupling agent, a conductive grant agent, an inorganic filler, etc. with these resins. A resin is [the carbon fiber of the rate of the resin and carbon fiber which constitute the hand for transport devices] usually 50 - 70 % of the weight preferably 30 to 80% of the weight 30 to 50% of the weight 20 to 70% of the weight. When there are few rates of a resin than 20 % of the weight, defects, such as a void, may be produced in the interior of a CFRP moldings, and intensity may fall to it. On the other hand, when [than 70 % of the weight] more, there is a possibility that the elastic modulus and thermal conductivity of a CFRP moldings may become low, and a coefficient of thermal expansion may also become large.
[0011] As the manufacture method of the hand for transport devices, when thermosetting resin is used as a resin When non-hardened thermosetting resin is beforehand infiltrated into the carbon fiber lengthened and arranged and thermoplastics is used as a resin on the other hand the heat hardening after infiltrating the resin of a melting state into the carbon fiber lengthened and arranged, creating a prepreg, and carrying out the laminating of the prepreg of two or more sheets so that a carbon fiber may serve as predetermined orientation -- or hot forming is carried out and a hardened material is obtained the obtained hardened material is cut in a predetermined configuration -- having -- a screw -- a hole etc. is dug
[0012] thus, the obtained hand for transport devices -- JIS it measured based on K7074 -- bending -- an elastic modulus -- 130GPa(s) the above -- desirable -- 180-400GPa it is . Bending elastics modulus are 130GPa(s). If small, when the length of the hand for conveyance is long, a deflection will become large too much and the position control at the time of conveyance will become difficult. In the case of a long picture, the hand for transport devices of this invention usually has the length especially preferably as effective as 0.8m or more from a part for a connection with the transport device of a hand to the nose of cam of a hand 0.5m or more. Moreover, although thickness changes also with transfer object articles, it is usually 3-20mm. As the transfer method of the goods by the hand for transport devices, a hand is usually inserted in the middle space portion of transfer goods, and the method of making goods carry and transport on a hand is mentioned.
[0013]
[Example] Hereafter, this invention is explained using an example.
<Example 1> <prepreg used> prepreg-1 modulus-of-elasticity-in-tension 24t/mm2 Prepreg by the Chemicals composite company which the non-hardened epoxy resin was infiltrated into the cross of a PAN system carbon fiber, and was obtained "HMF 3113/948"
- The prepreg by the Chemicals composite company which the pitch based carbon fiber ("K13710" by Mitsubishi Chemical) of 2 and thermal conductivity 140 W/mK was lengthened and arranged with ** on the other hand, and the non-hardened epoxy resin was infiltrated, and was obtained prepreg -2 65t [/mm] modulus of elasticity in tension "HYEJ34M65D"
- Prepreg-3 modulus-of-elasticity-in-tension 24t/mm2 Prepreg by the Chemicals composite company which the PAN system carbon fiber was lengthened and arranged with ** on the other hand, and the non-hardened epoxy resin was infiltrated, and was obtained "HYEJ25"
[0014] 1 ply laminating of the prepreg -1 was carried out to order from the <manufacture of hand for transport devices> front

face. Next, the carbon fiber made the longitudinal direction of the hand for conveyance 0 times for the prepreg -2, they carried out the repeat laminating twice 0 times, having used 60-degree - 60 degree six plies of - 60 degrees, 60 degrees, and 0 times as the unit, 1 ply laminating of -1 was carried out for the prepreg to the last, and the layered product was obtained.

[0015] 120 degrees C of obtained layered products were held for 90 minutes by 2 the press pressure of 7kg/cm, and the hardened material with a thickness of 4.1mm was obtained. It considered as the hand for conveyance as performs cutting and drilling processing and shows this hardened material to drawing 2 . The bending elastic modulus of the obtained hand for transport devices, specific gravity, a deflection, and coefficient of thermal expansion were measured. A result is shown in Table -1. The Instron type testing machine 2300 type made from in TESUKO and coefficient of thermal expansion were the thermal-expansion meters DL1500 by the vacuum science-and-engineering company about the material which shows a bending elastic modulus above, and the deflection fixed only the end so that 1m might come out of the above-mentioned material in midair, and it measured the amount of deflections of the other end of 1m beyond with the micro gage.

[0016] The hand for conveyance of the same configuration as an example 1 and a size was created using <examples 1 and 2 of comparison> iron "SS41" (example 1 of comparison), and the aluminum containing alloy "aluminum7075" (example 2 of comparison). The bending elastic modulus of the obtained hand for transport devices, a weight, a deflection, and coefficient of thermal expansion were measured. A result is shown in Table -1.

[0017]

[Table 1]

表－1

	曲げ弾性率 (GPa)	比重 (－)	たわみ (mm)	長手方向熱膨張率 (10^{-6}／℃)
実施例1	160	1．7	9	－0．2
比較例1	210	7．8	36	11
比較例2	75	2．7	35	21

[0018] The hand for transport devices of this invention is more nearly lightweight than a table, and it turns out that it can detach and attach simple alone. Furthermore, since the hand for transport devices of the example 1 of comparison and the example 2 of comparison is bent by self-weight, when equipment is equipped, the interval of the receipt case of a conveyance object becomes large, and it is guessed that space efficiency is bad.

[0019]

[Effect of the Invention] According to this invention, it bends, and distortion is small and can offer the hand for transport devices with easy control of a position.

[Translation done.]